

Sensors Directorate: facing the challenges of developing innovative sensors in the 21st Century

by Sensors Directorate

WRIGHT-PATTERSON AFB, OHIO

— On May 5, Sensors Directorate people, with shovels in hand, literally dug in to shape their future by breaking ground on a \$13.5 million Phase III addition to Building 620. This new addition will launch a major effort to implement the Air Force Research Laboratory's Collaborative Enterprise Environment (CEE), which will provide the framework on how the laboratory develops new technology for the 21st century warfighter.

Located next to the existing sensors research complex, the Phase III military construction project, known

as Consolidated Sensors Laboratory, will consolidate widely separated laboratories and engineering workstations. The project will meet the requirement for the integration of sensors work being accomplished to support warfighters' sensor and information needs.

Phase III will provide approximately 62,000 square feet for automatic target recognition, sensor fusion and a collaborative engineering environment supporting technology development and weapon system demonstrations.

Under a banner of cooperation, the Sensors and Information Directorates

are partnering in applying CEE to simulation-based acquisition in a laboratory environment for the development and demonstration of information and sensors technologies. The new addition will include a floor dedicated to the Information Directorate's collaboration science and simulation.

As the hub of an AFRL framework, it will tie together other major Air Force assets including the Aerospace Systems Center's Simulation and Analysis Facility, high performance computers in the Major Shared Resource Center and the Electronic System Center's Command and Control Unified Battlespace Environment.

As a major cultural change in the research and development process, the CEE concept involves applying state-of-the-art simulation and information technology to the way business is done. CEE enables partnerships among the laboratories, industry, and the war fighter to accelerate the development and transition of leading edge technology to operational weapons systems. This kind of forward thinking has to be applied for the Sensors Directorate to meet future requirements of the warfighter. Especially if the directorate is to meet its vision to provide "a full range of affordable air and space sensors networked to the warfighter, that assure: complete and timely picture of the battle space; precision engagement of threats; and survivability of our own forces."

Pursuit of that vision is in the forefront of the directorate's engi-



BEGINNING THE WORK — Brigadier General Paul D. Nielsen (right corner) and members of the Sensors Directorate break ground on an addition to the Sensors laboratory. The addition will provide additional space for automatic target recognition, sensor fusion and a collaborative engineering environment supporting technology development and weapon system demonstrations.

neers and scientists thinking as they face the challenges of the 21st Century. They have a simplistic view: to give the war fighter the best technology available to detect, identify and defeat any threat that might be encountered during future engagements. This challenge is being met by more than 700 scientists, engineers, and support personnel working in modern research facilities located at Wright-Patterson AFB, Ohio, Rome, New York and Hanscom AFB, Massachusetts.

Some of the high profile projects the directorate is pursuing to meet these challenges include Sensor Craft, Targets Under Trees and Infrared Countermeasures for Large Aircraft. These are just a few examples how the Sensors Directorate is meeting the needs of the war fighter today and — for tomorrow's mission.

Sensor Craft is the visionary airborne component of a fully integrated air and space intelligence, surveillance, and reconnaissance (ISR) capability. Blending a wide spectrum of emerging technologies, Sensor Craft is an unmanned air vehicle (UAV) equipped with multiple advanced sensing devices that are actually integrated into the airframe. The Sensors Directorate is examining this innovative concept in collaboration with a multitude of partners. Considered an AFRL multi-directorate shared vision, the Sensor Craft combines critical emerging flight vehicle, propulsion, sensor, and information technologies into a highly responsive platform concept that provides revolutionary ISR capabilities to the warfighter.

This Sensor Craft will combine extremely long endurance with omnidirectional sensing capabilities. The concept is to provide a "virtual presence" providing commanders with continuous and detailed information of the battlefield to include target detection, identification, and tracking. This unique combination of advanced sensors and sustained presence will allow commanders to react quickly and with greater precision to a dynamic combat environment.

Several aircraft and propulsion



IT'S A BIRD, IT'S A PLANE, NO IT'S... — Sensor Craft is one of many high profile projects taking place at the Sensors Directorate. The sensorcraft is an unmanned air vehicle equipped with multiple advanced sensing devices actually integrated into the airframe.

configuration are under study to determine the best possible tradeoffs among endurance, altitude, engine efficiency, and power generation.

The Sensor Craft configuration is driven by the needs of the advanced sensor payload, radio frequency, and electro-optical aperture requirements. These new sensing capabilities will result in continuous, all-weather, theater air and ground target acquisition, geo-location, and tracking of low observable and time-critical targets that may be concealed by foliage or camouflage.

While the Sensor Craft is part of a far-term solution for an integrated air and space ISR capability, technologies, which are currently available, are being evaluated to solve the near-term problem of targets hidden by camouflage or foliage. Under a study directed by the Air Force Chief of Staff, the Directorate, along with other partners, are examining sensor technology which can be moved quickly from the laboratory to provide the Air Force with an improved capability to find, identify, and engage mobile targets deployed in "deep hide."

Known as Targets Under Trees (TUT), AFRL is assessing several technologies including hyperspectral imaging, active laser sensing, unattended ground sensors and foliage penetration radar (FOPEN). While still examining a wide assortment of subsystem options and concepts of operation, a FOPEN radar system will be a central component of the eventual recommendation. An advance FOPEN radar system is already currently under development as a joint DARPA, Air Force and Army Advanced Technology Demonstration (ATD) program.

One major threat that Air Force is facing is small infrared missiles. The Sensors Directorate, cooperating closely with the Directed Energy Directorate, is researching laser solutions to protect military aircraft from shoulder mounted infrared guided missiles. The new era of guided missiles have longer ranges, better guidance, resist countermeasures and higher seeker sensitivity. Along with their effectiveness, they are relatively low cost.

The directorate is working to transition advanced technology for a directed laser jammer to defeat the IR missile threat. The Laser Infrared Flyout Experiment ATD supports countermeasure technology transition into Air Mobility Command's aircraft. The program is developing advanced technology that address all countermeasure requirements, which includes critical missile launch

warning and the advanced countermeasures capability called Closed-Loop Infrared Countermeasures. This technology counters the missile by directing a high intensity modulated laser into the infrared seeker providing deceptive jamming effect on the guidance.

To be effective, the missile warning system must be capable of detecting and precisely handing off the position of a small infrared missile launch fired up to six kilometers away. The laser must be steered rapidly to engage the threat

countering the missile's seeker. The entire engagement from launch to impact takes only seconds.

These programs are just a few of the challenges facing the directorate in the 21st Century. However, they demonstrate the directorate's resolve, working with all of its partners, to provide the warfighter with innovative state-of-the-art sensor technologies that enable revolutionary military capabilities.

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